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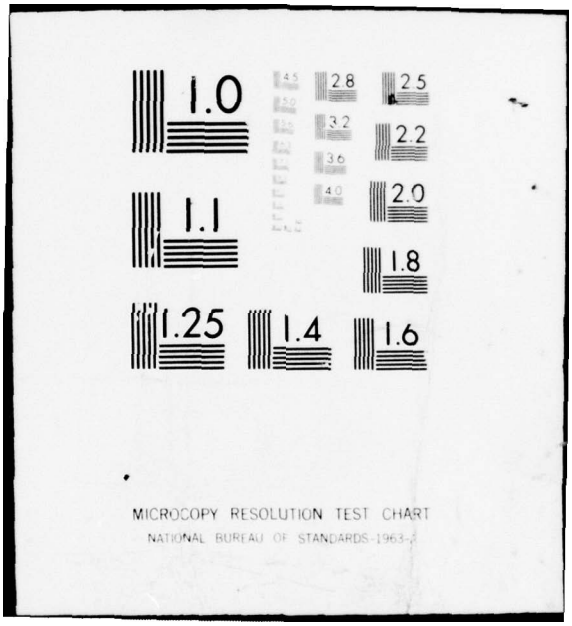
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INCOME GROUP DIFFERENCES IN RELATIONSHIPS AMONG SURVEY MEASURES OF PHYSICAL AND MENTAL HEALTH

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ABSTRACT

The present research tested the hypothesis that the experience of health is hierarchically organized such that gratification of physical health needs must precede gratification of mental health needs. It was reasoned that, because the nondisadvantaged have greater resources for the gratification of health needs in general, mental health symptoms would be more salient for this group and thus better able to explain variance in both mental and physical illness. On the other hand, it was reasoned that physical health symptoms would be more salient and thus better able to explain variance in both mental and physical illness for the disadvantaged. The results of the study indicated income group differences in patterns of relationships among health variables, supporting the hypothesis and suggesting important differences in the validity of health measures across income groups. The results were related to existing findings in medical sociology, and suggestions for the direction of future research were made.

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I. INTRODUCTION

Considerable evidence exists documenting the differential prevalence of both mental and physical illnesses across social classes; in general, they tend to be more prevalent among those of lower socioeconomic status (SES).[1-5] Persons of lower SES, in addition to experiencing poorer health, are also more concerned about the possibility of contracting physically debilitating diseases,[6] and view themselves as more susceptible to illness in general.[7] Finally, the economically disadvantaged tend to value physical health more highly and mental health less highly than do the economically nondisadvantaged.[8]

Such research findings suggest that physical health factors may be more salient (i.e., carry greater weight) for the economically disadvantaged than for the nondisadvantaged. Some investigators,[9-11] pursuing this subject from a different perspective, have found that a person's sensitivity and response to symptoms may be affected by sociocultural factors, such as ethnic background. The work of Zola[9] is particularly interesting in this regard, because it suggests that a person's interpretation of a given symptom and the type of medical care he/she would subsequently seek varies across different cultural groups.

The research reviewed here indicates that there is a positive relationship between health status and SES, and that personal recognition of and response to symptoms varies across sociocultural groups. A number of interesting questions are suggested by these findings. For example: Are there different relationships among health variables across SES groups? Are there differences in response patterns to mental and physical symptoms across groups? The answers to such questions would allow us to assess the possible differential validity of health measures across SES groups.

Maslow's[12] concept of a "need hierarchy" seems especially applicable to the formulation of hypotheses in this research area. Maslow has suggested that gratification of one basic need is followed by

domination of consciousness by another need higher in the hierarchy. It is reasonable to assume for a generally healthy population that the experience of health is hierarchically organized such that physical health needs must be gratified before mental health needs. Because the economically nondisadvantaged in our society have had greater resources available to apply to gratification of health needs in general, we would expect physical health symptoms* to be less salient for this group than they are for the disadvantaged. Thus, we would predict that physical health symptoms would be relatively better able to explain variance in both physical and mental illness for the disadvantaged than for the nondisadvantaged. We would also predict that physical health symptoms would account for more of the variance in mental and physical illness for the disadvantaged than would mental health symptoms. Specifically, we expect that physical health symptoms such as limitations in physical activities will explain more of the variance in both bed days and recognition of severe emotional problems for the disadvantaged. Conversely, we would expect that mental health symptoms would be more salient for the nondisadvantaged and thus better able to explain variance in both mental and physical illness for this group. Specifically, we would expect that mental symptoms such as depression and anxiety will explain more of the variance in both recognition of severe emotional problems and bed days for the nondisadvantaged.

The hypotheses outlined here also suggest comparable relationships between SES and other more global measures of mental and physical health. For example, we would expect that the nondisadvantaged would be more likely than the disadvantaged to have a larger mental than physical health component in their general health perceptions. Conversely, we would expect that physical health symptoms would carry proportionately more weight in explaining the general health perceptions of disadvantaged groups.

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*In this discussion, *symptom* refers to specific and quantifiable attributes of mental or physical health problems, such as anxiety and physical limitations, respectively. *Illness* refers to the response of the person to his mental or physical symptoms, such as recognition of severe emotional problems, and the person's decision to stay in bed when sick, respectively.

II. METHODOLOGY

Sampling and Data Gathering

In the summer and fall of 1974, data were gathered on all members of 2506 families residing in a sample of households in Dayton, Ohio. Dayton is one of four sites included in the Health Insurance Study (HIS) that The Rand Corporation is conducting for the U.S. Department of Health, Education, and Welfare.[13] During the fall and winter of 1974, a total of 646 families chosen to be representative of the 2506 families[14] were offered enrollment in the HIS and 593 accepted. The HIS enrollee sample differed intentionally from the Dayton population in several respects: (a) heads of households were restricted to age 59 and younger; (b) low-income families ($9,000 and below) were oversampled and the upper range for family income was truncated at $27,000 (in 1973 dollars); and (c) persons in institutions and in the military (thus eligible for medical care outside the fee-for-service system) were excluded.

Data were gathered using a self-administered Medical History Questionnaire that included items relating to physical and emotional symptoms, functional limitations, health perceptions, health habits, and life satisfaction. All heads of households were required to self-respond and all persons over 18 were asked to self-respond if present; all other responses were done by proxy, generally the head of the household. Interviewer assistance was provided when needed.

For purposes of the current study, analyses were restricted to data on 823 enrollees 14 years of age and older (a representative sample of adults from the 593 families enrolled). Those in the analysis sample ranged from 14 to 75 years of age; the average age was 34.6. Forty-eight percent of the sample was male and 52 percent female. Approximately 12 percent was nonwhite. The average number of school years completed was 12.6. Reported annual family income (in 1973 dollars) ranged from $0 to $27,000, with an average of $13,687.

Income Groups

To study differences in relationships among health variables, the sample was divided into four mutually exclusive groups on the basis of reported annual family income: (a) $6,000 or less (n=122; approximately 15 percent of the sample); (b) $6,001 to $12,000 (n=212; approximately 26 percent); (c) $12,001 to $18,000 (n=262; approximately 32 percent); and (d) $18,001 and over (n=227; approximately 27 percent). The groups were defined to be sufficiently large so that the subjects-to-variables ratio was at least 10:1 for all regression analyses.

Variables Used in the Analyses

We have previously defined symptoms as specific and quantifiable attributes of mental or physical health problems, and illness as the response of the person to those symptoms. However, there certainly exist symptom-illness-symptom cycles that throw open to question the causal directionality of the relationship between symptoms and illnesses as herein defined. For example, consider bed days and mental health symptoms. Bed days may not necessarily result from depression in the higher income groups; depression may be the result of prolonged days in bed. It may well be that for the nondisadvantaged, symptoms of depression are more acceptable if one is confined to bed. Recognizing this situation and not wishing to imply causality, we have termed the sets of variables used in the analyses "explanatory" and "target" variables, rather than independent and dependent variables.

Explanatory Variables: Symptoms. Explanatory variables were divided into two groups on the basis of the component of health that they primarily defined--physical or mental--and were operationally defined as scores from scales constructed from the HIS Medical History Questionnaire using traditional scaling methods. (Assignment of these variables to the two groups was supported by factor analysis of correlations among scale scores; the two more important factors that were derived corresponded to physical and mental health constructs.[15])

The first group included six scales that contained items pertaining to observable physical limitations and abilities and are referred

to as *physical symptoms*. Three of these scales were constructed, from items used by Hulka and Cassel,[16] according to the method of summated ratings[17] and pertained to performance of minimal, light, and moderate tasks requiring physical abilities. The abilities scales contained three or four items each and internal-consistency reliabilities ranged from 0.86 to 0.90. The remaining three scales pertained to chronic functional limitations (due to poor health) in mobility, physical activities, and social activities.[18] The functional limitations scales were evaluated according to the criteria of scalogram analysis[19] and contained three to five items each; reproducibility coefficients ranged from 0.90 to 0.98.

The second group of six scales were constructed from items used by Dupuy[20] that pertained to psychiatric symptoms and mood fluctuations (anxiety, agitation, depression, emotional stability, life satisfaction, and love life) and are referred to as *mental symptoms*. The mental symptoms scales were constructed according to the method of summated ratings after factor analytic verification of hypothesized item groupings, i.e., factor scaling.[21] These scales contained from two to six items each; internal-consistency reliability coefficients ranged from 0.61 to 0.89. (For a complete listing of all items, see Appendix A.)

Target Variables: Responses to Symptoms and Quality of Life. The target variables, i.e., the variables explained in the current study, pertained to recognition of or response to symptoms and quality of life. Four variables were used: (a) Bed Days: self-report of the number of days each respondent had to stay in bed because of poor health during the prior three months; (b) Recognition of Severe Emotional Problems: a single-item measure of the extent to which the respondent perceived severe problems (personal, emotional, behavioral, or mental) during the prior year; (c) General Health Perceptions: a seven-item summated ratings scale to measure general health (internal-consistency reliability of 0.88); and (d) Quality of Life: a three-item summated ratings scale containing items like those used by Cantril[22] (internal consistency reliability of 0.75). (For a complete listing of all items, see Appendix A.)

Analysis Plan

The data were analyzed in four stages. First, the significance of the differences among income groups in terms of mean scores for all explanatory and target variables was tested. Second, a number of multiple linear regression models were computed for each income group to describe the relationships among explanatory and target variables. Three regression models were computed for each of the four target variables in order to estimate the amount of variance shared with the physical and mental health variables (areas of overlap as shown in Figure 1). Third, selected squared multiple correlations (R^2 values) were standardized to facilitate comparison of results across both target variables and income groups. Each of these analyses is explained below in greater detail. All hypotheses were tested using F-ratios; chance probabilities of less than 0.05 were considered significant.

Differences in Means. One-way analysis of variance was used to test the hypothesis that means for all explanatory and target variables were equal for all income groups. Chance probabilities of less than 0.05 for a Type I error were considered significant. These analyses of mean differences constituted a partial replication of previous studies of income group differences in the prevalence of physical and mental symptoms and were useful in interpreting the results of regression analyses.

Multiple Regression: The Full Model. Regression models were calculated to estimate the amount of overlap and to better understand the nature of the overlap between explanatory and target variables as defined in Figure 1. The full model consisted of the regression of one target variable at a time on all 12 explanatory variables, i.e., the area defined by P+M+PM in Figure 1. The full model was computed to test the hypothesis that there was no relationship between a given target variable and the 12 explanatory variables in a given income group. Sixteen full models were computed, one for each of the four target variables in each of the four income groups.

Multiple Regression: Physical and Mental Symptom Models. The physical and mental symptom models consisted of the regression of one target variable at a time on the six physical symptom variables and

the six mental symptom variables, respectively. Physical symptom models yielded estimates of the area defined by P+PM, and mental symptom models estimated the area defined by M+PM in Figure 1. These models were computed to test the hypothesis that there was no relationship between a given target variable and a given group of physical or mental symptom variables in a given income group. A total of 32 models were computed, one for each of the four target variables in each of four income groups for the physical symptom variables (16 models), and the same for the mental symptom variables (16 models).

Incremental Validity. Overlap between physical and mental symptom variables and each target variable (the area defined by PM in Figure 1) was observed. It was necessary, therefore, to compute the increment in variance explained by each group of explanatory variables to achieve a clearer picture of its validity in relation to a given target variable. In other words, if the area defined by PM were significant, both the physical and the mental symptom models would have appeared to have significant explanatory power although only one or neither of them might have had unique explanatory power. To take this into account, incremental validity coefficients[23] were estimated for each group of symptoms through the use of stepwise regression of target variables on the two groups of symptom variables. The incremental validity of the physical symptom variables (area P in Figure 1) was estimated by computing the increment in R^2 when the physical symptom variables were added to the regression after the mental symptom variables. (Note that the confounded variance, area PM in Figure 1, is not included in this incremental R^2.) The R^2 resulting from inclusion of the mental symptom variables during the first step of the regression served to estimate the area defined by M+PM in Figure 1. Thus, the incremental validity of the physical symptom variables was defined as the full model (P+M+PM) less M+PM. The same method was applied to estimate the incremental validity of the mental symptom variables (area M in Figure 1).

Relative Incremental Validity. Incremental validity coefficients as described above may vary across income groups because of group differences in full model R^2 values. In order to compare R^2 values

across income groups, as required to evaluate the health hierarchy hypothesis, it was necessary to standardize the incremental validity coefficients in terms of corresponding full model R^2 values. A standardized R^2 (relative incremental validity coefficient) for each incremental validity model was computed by dividing the incremental R^2 by the full model R^2 for that income group.

From the health hierarchy hypothesis, specific patterns of relationships in relative incremental validity coefficients across income groups would be expected. Specifically, for all target variables, it was expected that: (a) relative incremental R^2 values for mental symptom variables would increase as income increased; and (b) relative incremental R^2 values for physical symptom variables would decrease as income increased. In other words, if relative incremental R^2 values and income groups were ranked from high to low, a perfect positive correlation would be expected between ranks for *mental* symptom variables and income groups. Conversely, a perfect negative correlation would be expected between ranks for *physical* symptom variables and income groups. The chance probability of such a relationship in four pairs of ranks (one-tailed test) is 0.05 according to Ferguson.[24]

III. RESULTS

Income Group Differences in Health Variables

Results of comparisons of mean scores for income groups on mental, physical, and the four target variables are summarized in Table 1. Differences among group means were significant in five of the six comparisons involving mental symptom scores: lower income groups tended to have less favorable mental symptom scores. Differences among income groups in physical symptom scores were significant in three of six comparisons; again, lower income groups tended to have less favorable physical symptom scores. The same pattern of income group differences was observed for the four target variables. Three of the four comparisons among group means were significant with the lower income groups receiving less favorable scores. Lower scores on both mental and physical symptom variables for the lower income groups are consistent with published findings.

Explanatory Power of Full Models

The explanatory power of the full model (all 12 physical and mental symptom variables) was tested independently in relation to each of the four target variables for each of the four income groups. A summary of significance tests for the full models is presented in Table 2. In all instances the full model was valid: the 12 physical and mental symptom variables together explained a significant amount of the variance in all target variables for all income groups. For all but the Bed Days target variable, full models tended to be somewhat more valid for the higher income groups than the lower income groups.

Explanatory Power of Physical and Mental Symptom Models

Summaries of significance tests for physical and mental symptom models in relation to each of the four target variables in each of the four income groups are presented in Tables 3 and 4, respectively. Physical symptom variables explained a significant amount of the vari-

ance in Bed Days and General Health for all income groups and a significant amount of the variance in Quality of Life for the two highest (but not for the two lowest) income groups. The physical symptom variables did not explain a significant amount of the variance in Recognition of Severe Emotional Problems for any of the four income groups. The mental symptom variables explained a significant amount of the variance in all target variables for all income groups, with the exception of Bed Days for the two lowest income groups.

Incremental and Relative Incremental Validity Models

Regression findings regarding incremental and relative incremental validity models are best viewed in the context of all regression results. R^2 values are presented in Tables 5-8; these tables summarize validity findings for Bed Days, Recognition of Severe Emotional Problems, General Health Perceptions, and Quality of Life, respectively. In addition to the R^2 values for the validity models described in the previous sections, Tables 5-8 contain R^2 values for all income groups for: (a) overlap: difference between the full model and the sum of physical and mental symptom models (column 4); (b) incremental validity of mental and physical symptom models (columns 5 and 6, respectively); and (c) relative incremental validity of mental and physical symptom models (columns 7 and 8, respectively).

Bed Days. Examination of columns 7 and 8 in Table 5 indicates that the relative incremental validity of mental symptom variables in relation to Bed Days increased with increases in income, and the relative incremental validity of physical symptom variables in relation to Bed Days decreased with increases in income. For physical symptom variables, the pattern corresponds perfectly to that expected from the health hierarchy hypothesis. Relative incremental R^2 values ranged from a low of 0.61 for the highest income group to a high of 0.83 for the lowest income group. In other words, the overlap between Bed Days and the physical symptom variables (area P in Figure 1) decreased as income increased. Consistent with the health hierarchy hypothesis, a nearly opposite pattern was observed for mental symptom variables.

Relative incremental R^2 values ranged from a low of 0.01 for the lowest income group to a high of 0.21 for the highest income group. Only one anomalous result was observed in this pattern, for the second lowest income group. It should be noted that the Bed Days variable clearly correlated more strongly with the physical symptom variables than with the mental symptom variables in all income groups.

Recognition of Severe Emotional Problems. Examination of Table 6 indicates very strong support for the health hierarchy hypothesis vis-à-vis the Recognition of Severe Emotional Problems variable. The relative incremental validity of the mental symptom variables in relation to this target variable increased directly with increases in income, from 0.85 for the lowest income group to 0.94 for the highest income group. Relative incremental validity R^2 values for physical symptom variables in relation to Recognition of Severe Emotional Problems were much smaller and conformed almost exactly to expectations; only one minor anomalous result was observed. Recognition of Severe Emotional Problems clearly correlated more strongly with the mental than with the physical symptom variables in all income groups.

General Health Perceptions. A large amount of variance overlap between General Health Perceptions and both physical and mental symptom variables was observed (areas P and M in Figure 1, respectively). Relative incremental validity R^2 values ranged from 0.12 to 0.35 for mental symptom variables and increased consistently from low to high income groups (see Table 7). Relative incremental R^2 values for physical symptom variables were comparable for the three highest income groups, ranging from 0.39 to 0.44. Consistent with the health hierarchy hypothesis, the overlap between physical symptom variables and General Health Perceptions was greatest (R^2 = 0.74) for the lowest income group. The pattern of overlap between physical and mental symptom variables and General Health Perceptions followed that predicted from the health hierarchy hypothesis. While General Health Perceptions correlated uniquely with both the physical and mental symptom variables, the overlap between general health and mental symptom variables increased with increases in income and the overlap between general health and physical symptom variables tended to decrease with increases in income.

Quality of Life. Overlap between mental symptom variables and the Quality of Life score (area M in Figure 1) was much greater than the overlap between Quality of Life and the physical symptom variables. However, no trend in income group differences in overlap with Quality of Life were apparent in the relative incremental validity models for either mental or physical symptoms (see Table 8). It should be noted, however, that while the results of the relative incremental validity models did not conform to expectations for the Quality of Life variable, an examination of all other regression models reveals increases in R^2 values for both physical and mental symptom variables with increases in income for this variable.

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IV. DISCUSSION

Support for Health Hierarchy Hypothesis

A health hierarchy hypothesis derived from Maslow's[12] need hierarchy was developed to predict income group differences in relationships among variables used to define mental and physical health status. Specifically, it was hypothesized: (1) that correlations between illness (as herein defined by the target variables) and mental symptoms would be highest for the highest income group and would decrease as income decreases; and (2) that correlations between illness and physical symptoms would be highest for the lowest income group and would decrease steadily with increases in income. These hypotheses are consistent with published reports regarding social class differences in prevalence and interpretations of mental and physical symptoms, perceptions of susceptibility, and health value orientation.

It was also hypothesized that, for all income groups, both physical and mental symptoms would correlate significantly with illness regardless of whether the illness appeared to relate primarily to mental symptoms (i.e., Recognition of Severe Emotional Problems) or physical symptoms (i.e., Bed Days). This latter hypothesis is consistent with the existence of a general underlying health factor that accounts for at least significant correlations among all health measures.[7]

Study findings provide considerable support for these hypotheses. Both physical and mental symptoms correlated significantly with the four target variables (Bed Days, Recognition of Severe Emotional Problems, General Health Perceptions, and Quality of Life ratings), even when the overlap between sets of mental and physical symptoms was removed. These findings suggest that either or both mental and physical symptoms may explain health and illness behaviors and health-related ratings for all income groups. The four income groups also differed considerably in correlations among mental and physical symptoms and the four target variables. Three of the four target variables were always explained best by physical and worst by mental symptoms in the lowest income group. In contrast, these target variables were always

explained best by mental and worst by physical symptoms among the high income groups. In general, the pattern of differences across four income groups corresponded to that hypothesized, although the lowest income group clearly tended to differ from the other three groups in the direction predicted; the differences among the three higher income groups were less marked.

It is especially significant that the measure of General Health Perceptions conformed so consistently to expectation. Since general perceptions of health would be expected to reflect the contribution of both mental and physical health components, the results for this variable offer particularly strong support for the health hierarchy hypothesis.

Whereas the General Health Perceptions variable was expected to pose a critical test for the health hierarchy hypothesis, the Quality of Life rating variable was expected to pose the least meaningful test. The quality of a person's life is influenced by such a plethora of factors that it may have been an unfair test of the health hierarchy hypothesis. Income group differences predicted by the health hierarchy hypothesis in the relationship between mental and physical symptoms and Quality of Life ratings were not observed. For all income groups, a very large amount of the variance in Quality of Life ratings was explained by mental symptoms, whereas a much smaller amount was explained by physical symptoms. Trends in the physical and mental symptom models and the incremental validity versions of these models indicated increasing importance of both mental and physical symptom variables in relation to Quality of Life. This is consistent with the health hierarchy hypothesis for mental symptom variables, but contradictory for physical symptom variables. Contrary to the health hierarchy hypothesis, these results suggest that health as defined by mental and physical phenomena increases in importance in relation to Quality of Life with increases in income. However, as noted earlier, these trends were not apparent in the relative incremental validity models, and should be studied further before conclusions are drawn. The relationship between Quality of Life ratings and mental symptoms may have been overestimated in the current study due to similarity of

the methods employed in their measurement. Further research employing multiple methods of measurement[25] is necessary to obtain a clearer picture of the true relationship between these measures.

Although the theoretical framework outlined here may not be the only (or best) explanation of income group differences in the interrelationship among symptoms and target variables, the results certainly suggest that such relationships do differ for different income groups. This, in turn, implies that the validity of survey measures of health (i.e., how they should be used and interpreted) differs as a function of socioeconomic status. As we noted earlier, the disadvantaged tend to value physical health more positively than do the nondisadvantaged, while the nondisadvantaged tend to value mental health relatively more positively than the disadvantaged.[8] The results of the current study suggest that the health values of the different income groups may be related, not simply to differential prevalence of disease, but in addition to income group differences in illness response patterns to or with the same symptoms.

The notion of responding to symptoms as opposed to responding with symptoms reintroduces the causality problem mentioned earlier. We have opted for the hypothesis that different income groups respond differently, in terms of their illness behavior (as defined by the target variables), *to* mental and physical symptoms. However, the "respond with" concept must be considered as well. The relevance of this concept is best exemplified by the Bed Days target variable. Recall that our hypothesis states that the variance in physical and mental illness variables for the nondisadvantaged will be better explained by mental than physical health symptoms. The question of causality becomes less clear, however, when mental symptoms are used to explain Bed Days (a physical illness variable) for the nondisadvantaged, because the nondisadvantaged person who is forced for physical health reasons to spend days in bed may respond with increased depression. Thus, is it the number of bed days that intensifies the person's depression, or is it depression that causes the person to spend more days in bed? Issues of this nature require longitudinal, quasi-experimental study designs to gain a firmer understanding of

the causal relationships actually involved. The critical point, however, is that regardless of whether it is a "respond to" or "respond with" pattern, *differential patterns have been demonstrated across income groups.*

From the perspective of the health hierarchy hypothesis, we may speculate that due to the differential salience of health problems, reinforcement of the sick role may vary across social class. We might expect that social support for mental problems would be greater for the nondisadvantaged relative to the disadvantaged, while social support for physical problems would be greater for the disadvantaged relative to the nondisadvantaged. The manner in which a person responds to and *interprets* symptoms should certainly be subject to social reinforcement. According to the health hierarchy hypothesis, the differential *reinforcement* of symptom *interpretation* would derive from the differential *salience*, not prevalence, of mental and physical health symptoms across class.

It is important to note that the vast majority of the sample, as is the American population, was generally healthy. It is not clear to what extent the health hierarchy hypothesis would be as applicable to an "unhealthy" population. It is, however, reasonable to assume that, as an example, if a person from one of the higher income groups were to lose a leg or an arm, physical problems would immediately increase in salience for that person. How this would subsequently affect that person's interpretation of other health problems or symptoms, and whether the interpretation would conform to the health hierarchy hypothesis, are questions for further research.

Alternative Hypotheses

Although the data appear to offer support for the main hypothesis of this research, alternative explanations must necessarily be considered. The most plausible rival hypotheses are the following: (1) differential prevalence in health problems across income groups; (2) differential score variance for mental and physical symptoms across income groups; and/or (3) differential reliability of health measures across income groups. Any one of these three rival hypothe-

ses might explain the pattern of results; each one, however, can be contradicted upon examination.

First, the greater prevalence of mental and physical problems as an alternate explanation is not supported because the disadvantaged suffer from *both* more physical and more mental symptoms. As an alternative hypothesis, it would only be compelling if the disadvantaged suffered only a greater number of physical health symptoms. In addition, further support for the health hierarchy hypothesis was provided by the finding that while mental health symptoms were less prevalent among the nondisadvantaged, these symptoms explained a greater percent of the variance in three of the four target variables than did physical symptoms.

Second, when variances in scores for the symptoms across income groups were examined, it was clear that they were relatively comparable. Thus, the second rival hypothesis does not explain the pattern of results.

Third, a test of the hypothesis that differential relationships among the health measures derived from differential reliability of the measures across income groups was performed. Consistent with this hypothesis, some measures tended to be less reliable for the disadvantaged. Effects of these differences on relationships among health measures were tested by correcting correlations among symptom and response variables for attenuation due to differences in reliability. These corrections were performed for two middle-income groups prior to regression analyses. The results (which are available from the authors) did not support the third explanation. The corrected matrices yielded greater overlap for symptom and target variables for both groups (with the overlap increasing slightly more for the lower income group); however, the pattern of income group differences in overlap prevailed.

It should be noted that these results, which support the health hierarchy hypothesis, could be an artifact of the use of linear statistical models. The authors are presently testing the possibility that the differential relationships across income groups demonstrated herein may have resulted, in part, from curvilinear relationships within certain income groups or for certain variables.

Theoretical Implications of Study Results

The results of this research have some intriguing implications for the interpretation and use of survey measures of mental and physical health. If, as our data indicate, physical health symptoms are relatively better predictors of Recognition of Severe Emotional Problems for the disadvantaged than the nondisadvantaged, does this then imply that for the disadvantaged, these problems are relatively more of a "physical" disorder? The data indicate that the mental health component of Bed Days was much greater for the nondisadvantaged than disadvantaged. Does this suggest that Bed Days may result more from mental problems than physical problems for the nondisadvantaged?

Findings regarding income group differences in relationships among measures commonly used to define health status have important implications for further research. These differences must be taken into account in interpretation of findings from any studies of health and illness behavior. Whether the differences are large enough to warrant consideration in policymaking by health planners and evaluators is unclear, and should be further investigated.

In a recent paper, Mechanic[26] called for attributional analyses of health and illness behavior. Our data suggest directions in which such attributional analyses might go. Answers are needed for questions such as: How does the person perceive the causes of his/her illness? How does the person recognize and act upon symptoms? How does the person know that he/she is healthy or ill? How does he/she know how to respond to an illness episode? How does he/she know how to seek care for a given problem? What behaviors does the person believe will result in the speediest cure? Some of these issues are being addressed in the Health Insurance Study, being conducted by The Rand Corporation for the U.S. Department of Health, Education, and Welfare, in which a comprehensive set of health measures are being obtained for a large number of respondents over a period of three to five years.[13]

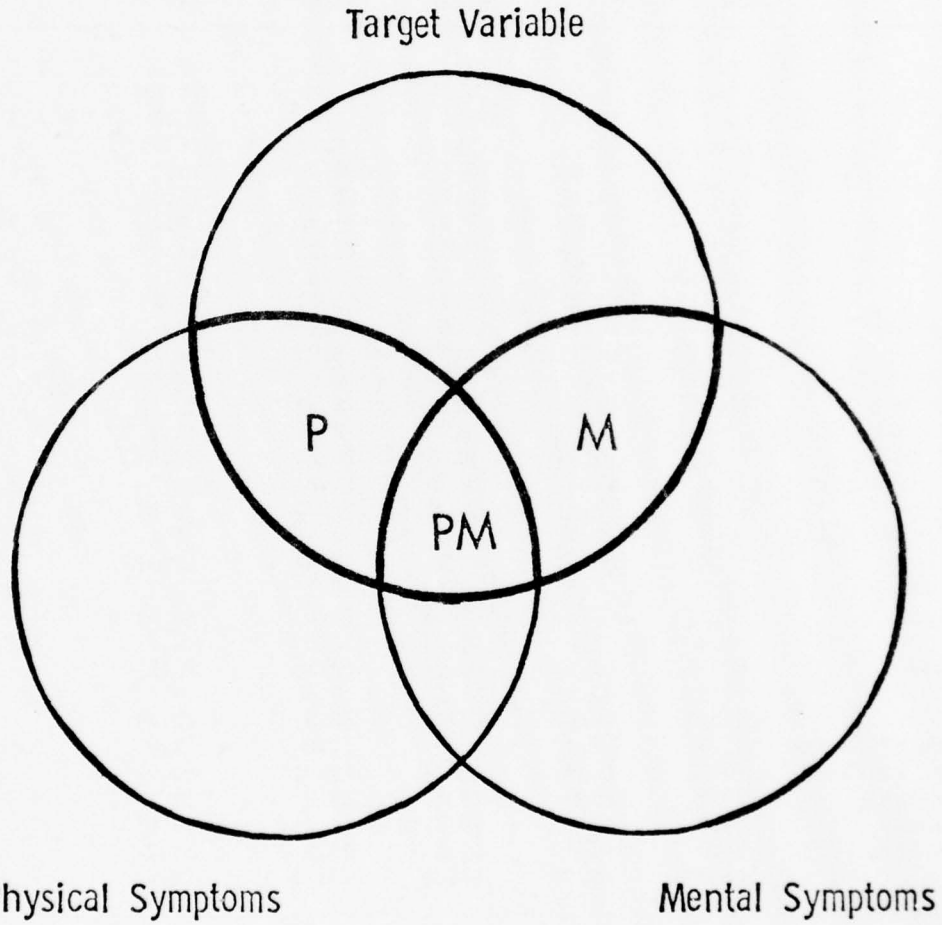

Fig. 1

Representation of the Overlap Between Symptom and Target Variables

Table 1

MEANS AND STANDARD DEVIATIONS (IN PARENTHESES)
OF SCORES ON EXPLANATORY AND TARGET VARIABLES, BY INCOME GROUP,
AND F-RATIOS FOR SIGNIFICANCE OF DIFFERENCES AMONG GROUPS

		INCOME GROUP				
Variable	Total Sample N=823	$0 - 6,000 N=122	$6001-12,000 N=212	$12,001-18,000 N=262	$18,001+ N=227	F[§]
Anxiety	9.9	10.3	10.1	9.6	9.6	1.3
	(3.9)	(4.0)	(4.2)	(3.9)	(3.6)	
Depression	13.7	15.0	14.4	12.9	13.5	6.5**
	(5.0)	(5.5)	(5.2)	(4.4)	(4.9)	
Stability[†]	10.2	9.8	10.1	10.4	10.3	3.6*
	(1.8)	(1.9)	(1.9)	(1.7)	(1.8)	
Love Life[†]	9.0	8.2	8.9	9.3	9.2	5.7**
	(2.5)	(2.7)	(2.6)	(2.2)	(2.5)	
Agitation	8.5	8.6	9.1	8.3	8.2	3.1*
	(3.4)	(3.2)	(3.8)	(3.3)	(3.2)	
Life Enjoyment[†]	18.1	16.7	17.6	18.8	18.4	8.4**
	(4.4)	(4.7)	(4.7)	(3.9)	(4.2)	
Minimal Activities	9.0	9.0	9.0	9.0	9.0	< 1
Limitations	(0.3)	(0.5)	(0.3)	(0.4)	(0.1)	
Light Activities	8.9	8.8	8.9	8.9	8.9	< 1
Limitations	(0.6)	(0.7)	(0.6)	(0.6)	(0.5)	
Moderate Activities	11.6	11.3	11.7	11.6	11.7	2.5
Limitations	(1.4)	(1.8)	(1.3)	(1.4)	(1.3)	
Physical Activities	0.1	0.2	0.2	0.1	0.1	4.7**
Limitations	(0.4)	(0.5)	(0.5)	(0.4)	(0.3)	
Role Activities	0.1	0.3	0.2	0.1	0.1	4.6**
Limitations	(0.5)	(0.7)	(0.5)	(0.4)	(0.4)	
Mobility	0.6	0.1	0.0	0.0	0.0	1.7
Limitations	(0.2)	(0.4)	(0.2)	(0.3)	(0.1)	
Bed Days	0.6	0.9	0.5	0.5	0.6	< 1
	(2.5)	(3.7)	(2.0)	(2.3)	(2.4)	
Recognition of Severe	1.9	2.1	1.9	1.8	1.8	5.2**
Emotional Problems	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	
General Health	29.2	28.0	28.6	29.7	29.6	4.7**
Perceptions[†]	(5.0)	(5.8)	(5.2)	(4.7)	(4.6)	
Quality of Life	25.7	24.6	25.0	26.2	26.2	7.1**
Rating[†]	(4.1)	(4.3)	(4.5)	(3.7)	(4.0)	

[†] A high score on these scales defines a positive health state; for all other scales, a high score defines a negative health state.

[§] For all tests, degrees of freedom = 3 & 822

* $p < 0.05$

** $p < 0.01$

Table 2

EXPLANATORY POWER OF THE FULL MODEL FOR THE DIFFERENT INCOME GROUPS ON THE TARGET MEASURES[a]

Income Group	Bed Days		Recognition of Severe Emotional Problems		General Health Perceptions		Quality of Life Rating	
	F	P	F	P	F	P	F	P
$ 0 - 6,000 (n=122)	4.60 df=12,106	<.001	78.71 df=12,106	<.001	12.75 df=12,106	<.001	5.64 df=12,106	<.001
$ 6,000 - 12,000 (n=212)	4.03 df=12,195	<.001	13.98 df=12,195	<.001	15.55 df=12,195	<.001	13.79 df=12,195	<.001
$12,001 - 18,000 (n=262)	22.76 df=12,246	<.001	14.23 df=12,246	<.001	29.48 df=12,246	<.001	23.32 df=12,246	< .01
$18,001 = (n=227)	6.88 df=12,211	<.001	17.29 df=12,211	<.001	28.83 df=12,211	<.001	28.13 df=12,211	<.001

[a]High scores indicate more bed days, positive response to recognition of need question, favorable general health perceptions, and favorable quality of life rating.

Table 3

EXPLANATORY POWER OF THE PHYSICAL MODEL FOR THE DIFFERENT INCOME GROUPS ON THE TARGET MEASURES[a]

Income Group	Bed Days		Recognition of Severe Emotional Problems		General Health Perceptions		Quality of Life Rating	
	F	P	F	P	F	P	F	P
$ 0 - 6,000 (n=122)	156.74 df=6,112	<.001	<1 df=6,112	n.s.	20.47 df=6,112	<.001	2.01 df=6,112	n.s.
$ 6,001 - 12,000 (n=212)	6.37 df=6,201	<.001	1.92 df=6,201	n.s.	17.93 df=6,201	<.001	2.07 df=6,201	n.s.
$12,001 - 18,000 (n=262)	38.13 df=6,252	<.001	1.14 df=6,252	n.s.	28.73 df=6,252	<.001	5.83 df=6,252	<.001
$18,001 = (n=227)	10.12 df=6,217	<.001	1.14 df=6,217	n.s.	24.12 df=6,217	<.001	7.65 df=6,217	<.001

[a]High scores indicate more bed days, positive response to recognition of need question, favorable general health perception, and favorable quality of life rating.

Table 4

EXPLANATORY POWER OF THE MENTAL MODEL FOR THE DIFFERENT INCOME GROUPS ON THE TARGET MEASURES[a]

Income Group	Bed Days		Recognition of Severe Emotional Problems		General Health Perceptions		Quality of Life Rating	
	F	P	F	P	F	P	F	P
$ 0 - 6,000 (n=122)	3.34 df=6,112	<.01	8.70 df=6,112	<.001	3.35 df=6,112	<.01	9.80 df=6,112	<.001
$ 6,000 - 12,000 (n=212)	1.54 df=6,201	n.s.	27.68 df=6,201	<.001	12.95 df=6,201	<.001	27.32 df=6,201	<.001
$12,001 - 18,000 (n=262)	9.20 df=6,252	<.001	27.14 df=6,252	<.001	23.80 df=6,252	<.001	36.24 df=6,252	<.001
$18,001 = (n=227)	4.50 df=6,217	<.001	34.97 df=6,217	<.001	19.49 df=6,217	<.001	41.98 df=6,217	<.001

[a]High scores indicate more bed days, positive response to recognition of need, favorable general health perceptions, and favorable quality of life rating.

Table 5

SUMMARY OF R^2 VALUES FOR REGRESSION MODELS: DAYS IN BED

Income Group	Full Model (1)	Mental Model (2)	Physical Model (3)	Overlap (4)	Incremental Validity: Mental Model (5)	Incremental Validity: Physical Model (6)	Relative Incremental Validity: Mental Model (7)	Relative Incremental Validity: Physical Model (8)
$ 0- 6,000	90	15	89	14	1	75	1	83
$ 6,001- 12,000	20	4	16	0	4	16	20	80
$12,001- 18,000	53	18	48	13	5	35	9	66
$18,000+	28	11	22	5	6	17	21	61

Column:
(1) = Both Mental and Physical Symptom variables
(2) = Mental Symptom variables only
(3) = Physical Symptom variables only
(4) = (2) + (3) - (1)
(5) = (1) - (3)
(6) = (1) - (2)
(7) = (5) ÷ (1)
(8) = (6) ÷ (1)

Table 6

SUMMARY OF R^2 VALUES FOR REGRESSION MODELS: EMOTIONAL PROBLEMS

Income Group	Full Model (1)	Mental Model (2)	Physical Model (3)	Overlap (4)	Incremental Validity: Mental Model (5)	Incremental Validity: Physical Model (6)	Relative Incremental Validity: Mental Model (7)	Relative Incremental Validity: Physical Model (8)
$ 0- 6,000	34	32	5	3	29	2	85	6
$ 6,001- 12,000	46	45	5	4	41	1	89	2
$12,001- 18,000	41	39	3	1	38	2	93	3
$18,000+	50	49	3	2	47	1	94	2

Column
(1) = Both Mental and Physical Symptom variables
(2) = Mental Symptom variables only
(3) = Physical Symptom variables only
(4) = (2) + (3) - (1)
(5) = (1) - (3)
(6) = (1) - (2)
(7) = (5) ÷ (1)
(8) = (6) ÷ (1)

Table 7

SUMMARY OF R^2 VALUES FOR REGRESSION MODELS: GENERAL HEALTH PERCEPTIONS

Income Group	Full Model (1)	Mental Model (2)	Physical Model (3)	Overlap (4)	Incremental Validity		Relative Incremental Validity	
					Mental Model (5)	Physical Model (6)	Mental Model (7)	Physical Model (8)
$ 0 - 6,000	59	15	52	8	7	44	12	74
$ 6,001- 12,000	49	28	35	14	14	21	28	43
$12,001- 18,000	59	36	41	18	18	23	30	39
$18,000+	62	35	40	13	22	27	35	44

Column
(1) = Both Mental and Physical Symptom variables
(2) = Mental Symptom variables only
(3) = Physical Symptom variables only
(4) = (2) + (3) - (1)
(5) = (1) - (3)
(6) = (1) - (2)
(7) = (5) ÷ (1)
(8) = (6) ÷ (1)

Table 8

SUMMARY OF R^2 VALUES FOR REGRESSION MODELS: QUALITY OF LIFE RATING

Income Group	Full Model (1)	Mental Model (2)	Physical Model (3)	Overlap (4)	Incremental Validity		Relative Incremental Validity	
					Mental Model (5)	Physical Model (6)	Mental Model (7)	Physical Model (8)
$ 0-6,000	39	34	10	5	29	5	74	13
$ 6,001-12,000	46	45	6	5	40	1	87	2
$12,001-18,000	53	46	12	5	41	7	77	13
$18,000+	62	54	17	9	45	8	72	13

Column
(1) = Both Mental and Physical Symptom variables
(2) = Mental Symptom variables only
(3) = Physical Symptom variables only
(4) = (2) + (3) - (1)
(5) = (1) - (3)
(6) = (1) - (2)
(7) = (5) ÷ (1)
(8) = (6) ÷ (1)

APPENDIX A

Explanatory Variables: Physical Symptoms

Mobility Limitations

1. Are you in a hospital or other medical facility because of health?
2. Do you need help to go outside because of your health?
3. Does your health prevent you from driving or using public transportation?

Physical Activities Limitations

1. Do you use canes, crutches, artificial limbs, or braces to walk?
2. Are you in bed or a chair for most or all of the day because of health?
3. Do you have trouble walking?
4. Do you have trouble walking as far and as fast as is usual for persons your age?
5. Do you have trouble climbing a flight of stairs?

Role Activities Limitations

1. Do you need help with eating, dressing, or bathing, or using the toilet?
2. Does your health keep you from working at a job, doing work around the the house, or going to school?
3. Are you unable to do certain kinds of jobs, housework, or schoolwork because of your health?
4. Does your health limit the amount of work, housework, or schoolwork you can do?

Minimal Physical Activities

1. Can you dress yourself?
2. Can you walk to a table for meals?
3. Can you walk around inside the house?

Light Physical Activities

1. Can you walk a block or more?
2. Can you do light work around the house?
3. Can you walk uphill or upstairs?

Moderate Physical Activities

1. Can you run a short distance?
2. Can you move light furniture, vacuum, and lift or push up to 25 pounds?
3. Can you take part in sports such as swimming, bowling, golf?
4. Can you do harder activities at home, such as mow lawns, mop floors?

Explanatory Variables: Mental Symptoms

Agitation

1. Have you felt restless, fidgety, or impatient? (during the past month)
2. Have you been moody or brooded about things? (during the past month)
3. Have you felt jittery, irritable, or on edge? (during the past month)
4. Have you felt angry, frustrated, or bitter? (during the past month)

Love Life

1. Have you felt loved and wanted? (during the past month)
2. Was your love-sex life full and complete? (during the past month)

Life Satisfaction

1. Has your life situation been all you could wish for? (during the past month)
2. Have you felt well adjusted to your life situation? (during the past month)
3. Have you enjoyed life? (during the past month)
4. Have you lived the kind of life you wanted to? (during the past month)

Anxiety

1. Were you generally tense or did you feel any tension? (during the past month)
2. Did you feel relaxed, at ease or high strung, tight, or keyed-up? (during the past month)
3. Have you been under or felt you were under any strain, stress, or pressure? (during the past month)
4. Have you been bothered by nervousness or your "nerves"? (during the past month)

Depression

1. Have you felt so sad, discouraged, hopeless, or had so many problems that you wondered if anything was worthwhile? (during the past month)
2. Have you felt downhearted and blue? (during the past month)
3. Have you felt cheerful, lighthearted? (during the past month)
4. Did you feel depressed? (during the past month)
5. How happy, satisfied, or pleased have you been with your personal life? (during the past month)
6. How have you been feeling in general? (during the past month)

Emotional Stability

1. Have you been in firm control of your behavior, thoughts, emotions, or feelings? (during the past month)
2. Have you been emotionally stable and sure of yourself? (during the past month)

Target Variables: Recognition of Severe Emotional Problems

Have you had severe enough personal, emotional, behavioral, or mental problems that you felt you needed help during the past year?

Yes, and I did seek professional help 3

Yes, but I did not seek professional help 3

I have had (or have now) severe personal problems, but have not felt I needed professional help 3

I have had very few personal problems of any serious concern 2

I have not been bothered at all by personal problems during the past year 1

Target Variables: General Health Perceptions

1. During the past 3 months, how often has your health kept you from doing the kinds of activities other people your age do?
2. During the past 3 months, how much pain have you had?

3. During the past 3 months, how much has your health worried or concerned you?
4. During the next 12 months, do you expect your health will be excellent, good, fair, or poor?
5. How often were you bothered by any illness, bodily disorder, aches or pains? (during the past month)
6. Did you feel health enough to carry out the things you like to do or had to do? (during the past month)
7. Have you been concerned, worried, or had any fears about your health? (during the past month)

Target Variables: Quality of Life

1. Considering your life as a whole, how were things going with you this time a year ago?
2. Considering your life as a whole, how are things going with you now?
3. Considering your life as a whole, how do you think things will be going with you this time a year from now?

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